OIPE JC
JUN 02 2005
PATENT & TRADEMARK OFFICE

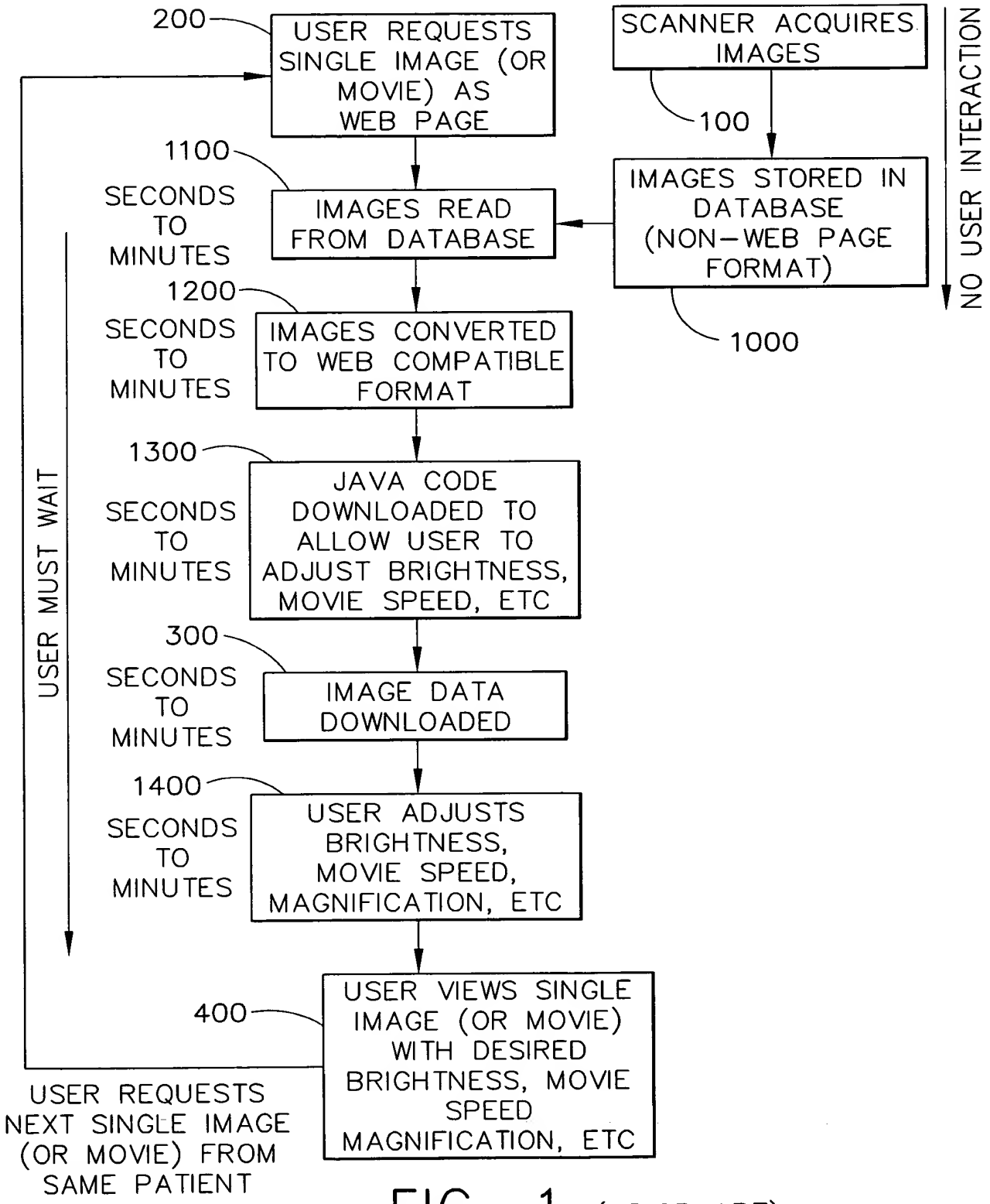

FIG. 1 (PRIOR ART)

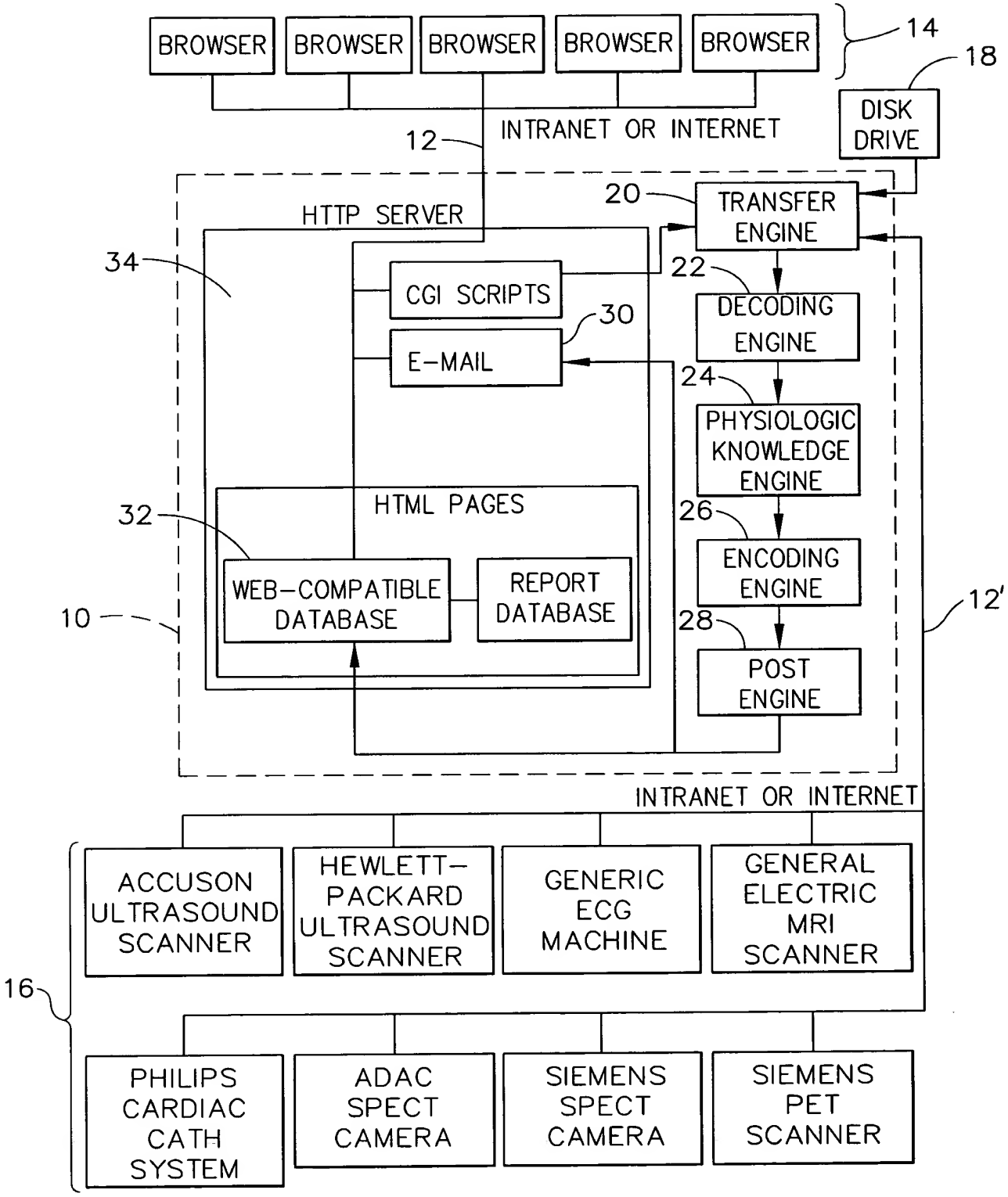
BROWSER
BROWSER
BROWSER
BROWSER
BROWSER
14
18
DISK DRIVE
INTRANET OR INTERNET
12
HTTP SERVER
20
TRANSFER ENGINE
34
CGI SCRIPTS
22
DECODING ENGINE
30
E-MAIL
24
PHYSIOLOGIC KNOWLEDGE ENGINE
HTML PAGES
32
26
ENCODING ENGINE
WEB-COMPATIBLE DATABASE
REPORT DATABASE
10
12'
28
POST ENGINE
INTRANET OR INTERNET
ACCUSON ULTRASOUND SCANNER
HEWLETT-PACKARD ULTRASOUND SCANNER
GENERIC ECG MACHINE
GENERAL ELECTRIC MRI SCANNER
16
PHILIPS CARDIAC CATH SYSTEM
ADAC SPECT CAMERA
SIEMENS SPECT CAMERA
SIEMENS PET SCANNER

FIG. 2

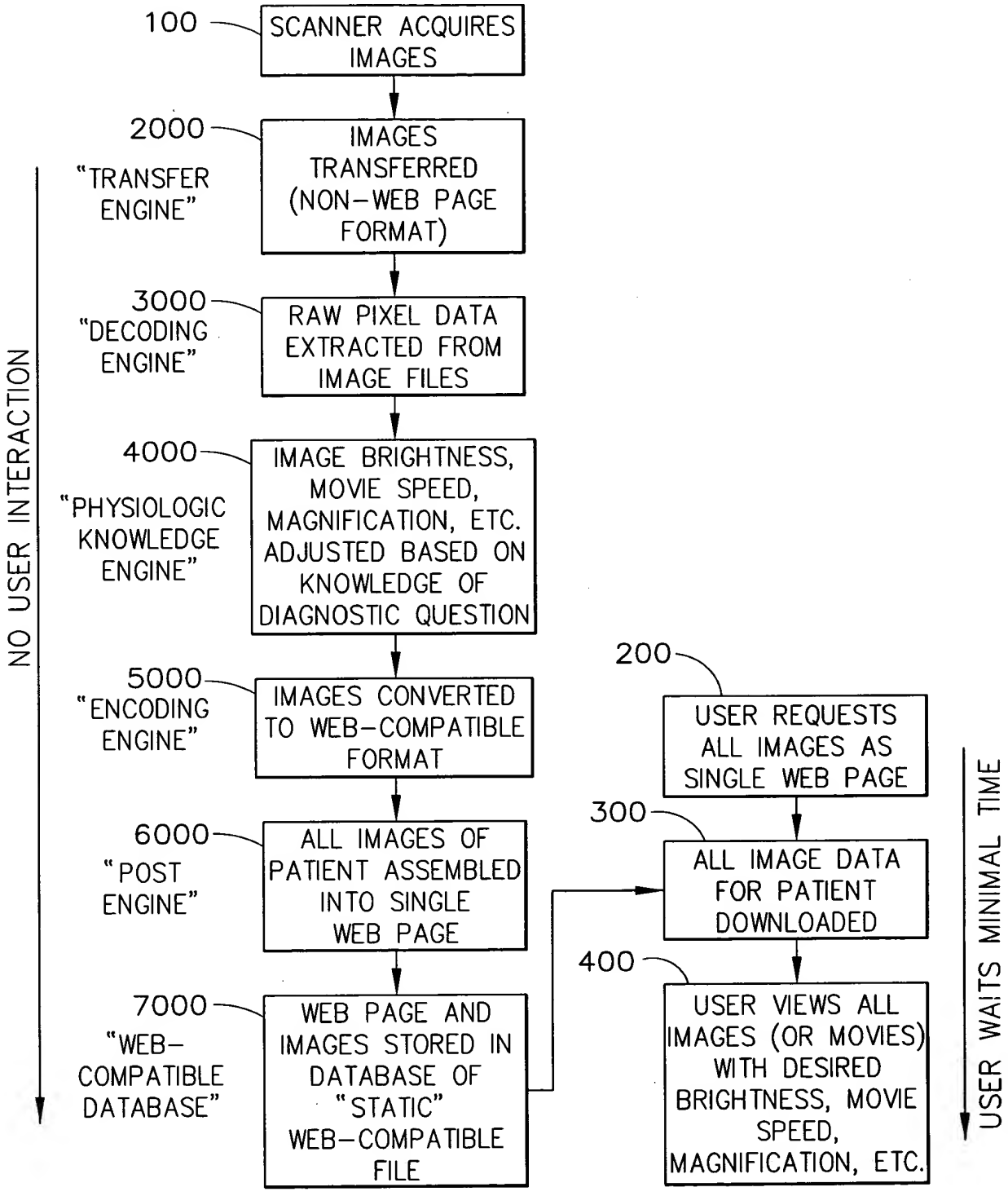
100
SCANNER ACQUIRES IMAGES
2000
"TRANSFER ENGINE"
IMAGES TRANSFERRED (NON-WEB PAGE FORMAT)
3000
"DECODING ENGINE"
RAW PIXEL DATA EXTRACTED FROM IMAGE FILES
4000
"PHYSIOLOGIC KNOWLEDGE ENGINE"
IMAGE BRIGHTNESS, MOVIE SPEED, MAGNIFICATION, ETC. ADJUSTED BASED ON KNOWLEDGE OF DIAGNOSTIC QUESTION
5000
"ENCODING ENGINE"
IMAGES CONVERTED TO WEB-COMPATIBLE FORMAT
6000
"POST ENGINE"
ALL IMAGES OF PATIENT ASSEMBLED INTO SINGLE WEB PAGE
7000
"WEB-COMPATIBLE DATABASE"
WEB PAGE AND IMAGES STORED IN DATABASE OF "STATIC" WEB-COMPATIBLE FILE
NO USER INTERACTION
200
USER REQUESTS ALL IMAGES AS SINGLE WEB PAGE
300
ALL IMAGE DATA FOR PATIENT DOWNLOADED
400
USER VIEWS ALL IMAGES (OR MOVIES) WITH DESIRED BRIGHTNESS, MOVIE SPEED, MAGNIFICATION, ETC.
USER WAITS MINIMAL TIME

FIG. 3

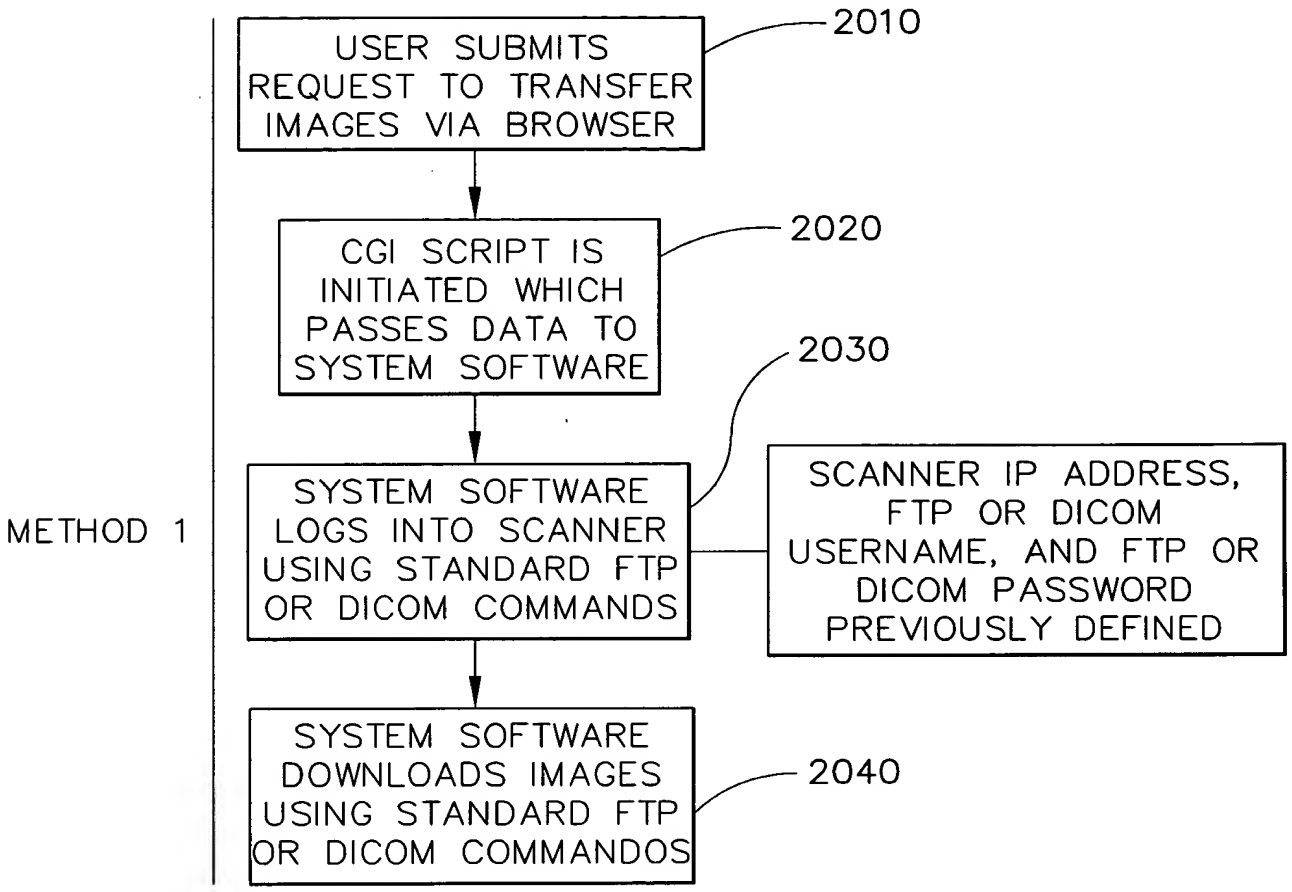

FIG. 4A

-OR-

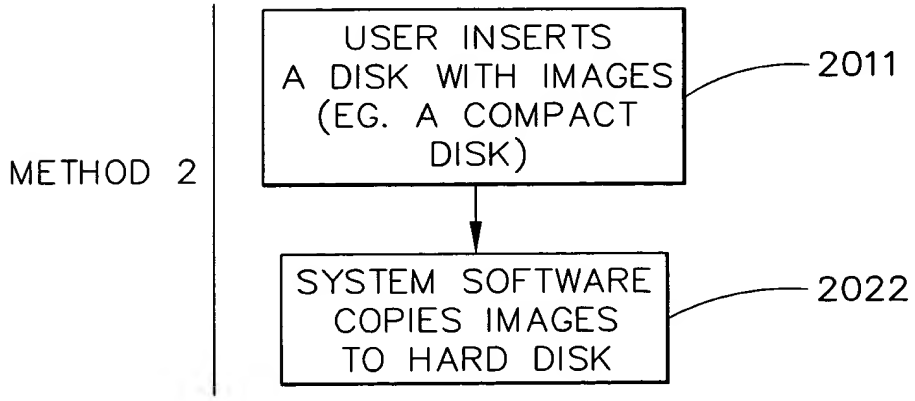

FIG. 4B

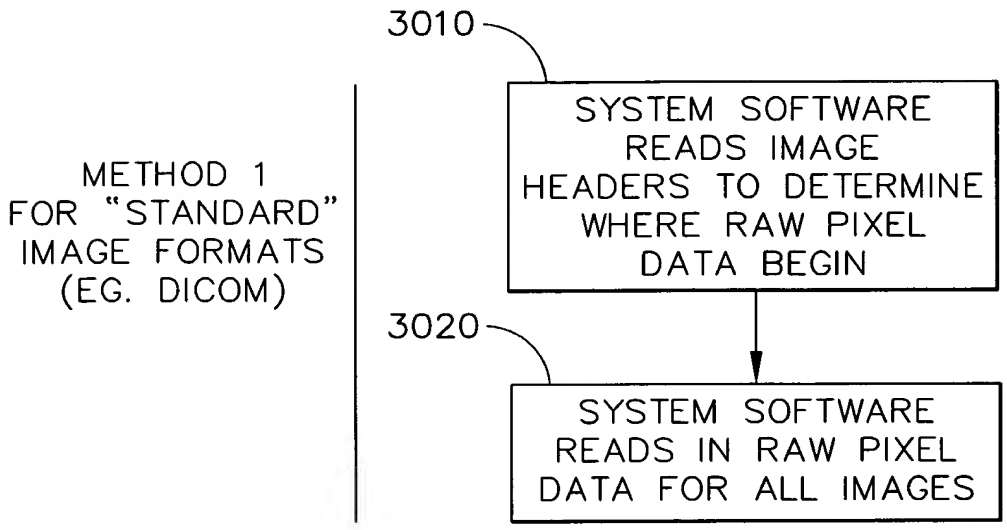

FIG. 5A

—OR—

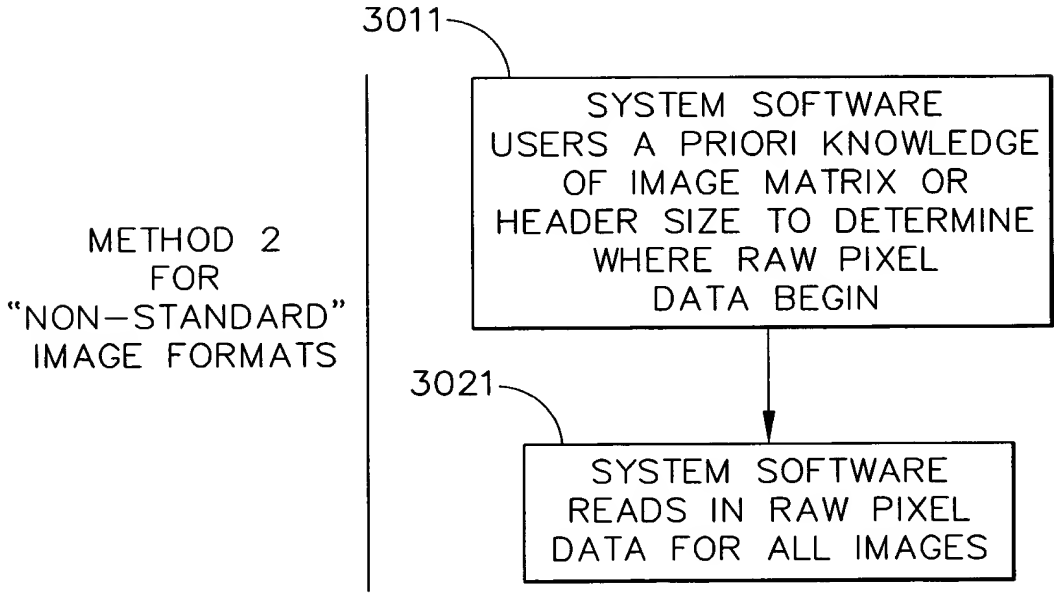

FIG. 5B

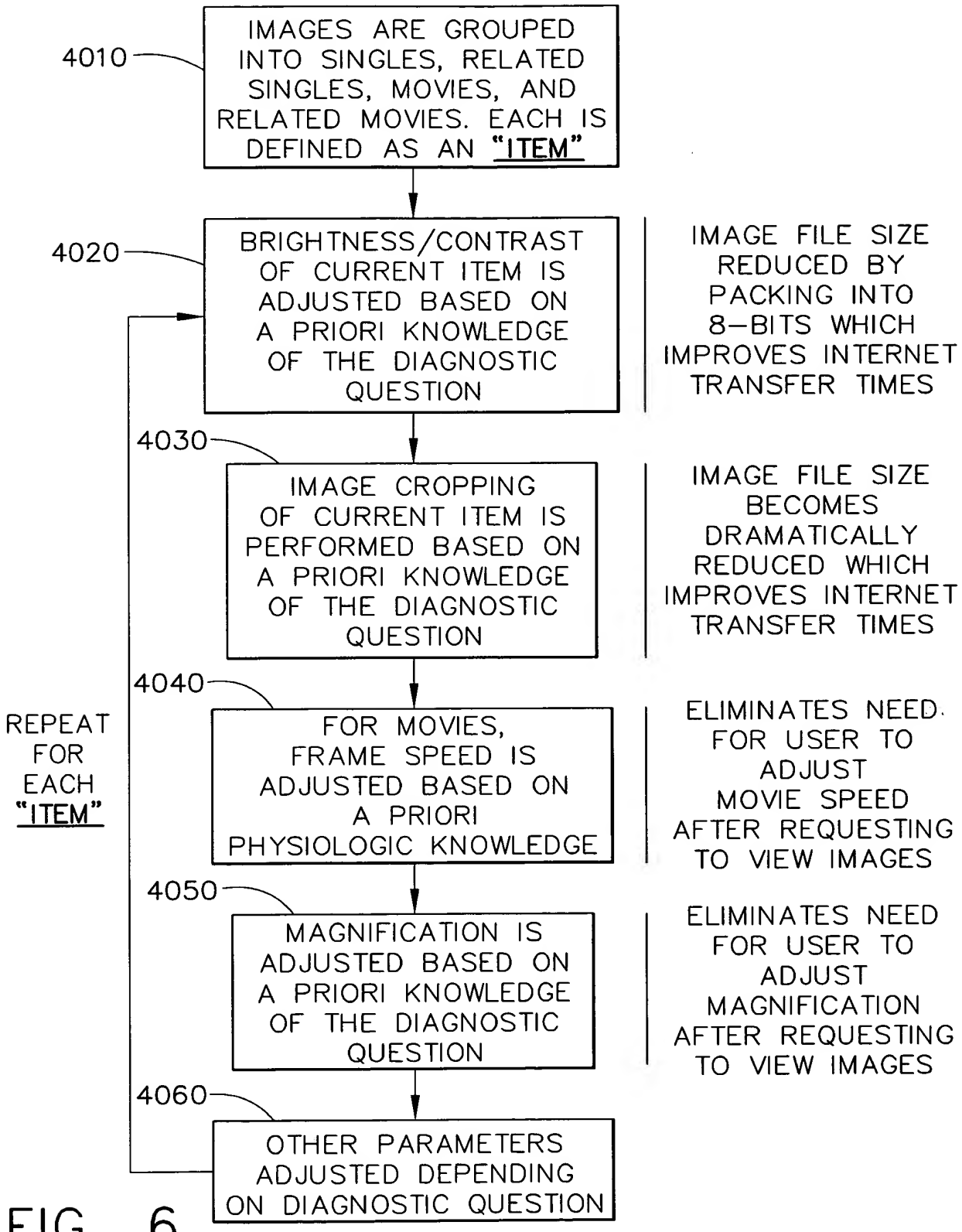
4010
IMAGES ARE GROUPED INTO SINGLES, RELATED SINGLES, MOVIES, AND RELATED MOVIES. EACH IS DEFINED AS AN "ITEM"
4020
BRIGHTNESS/CONTRAST OF CURRENT ITEM IS ADJUSTED BASED ON A PRIORI KNOWLEDGE OF THE DIAGNOSTIC QUESTION
IMAGE FILE SIZE REDUCED BY PACKING INTO 8-BITS WHICH IMPROVES INTERNET TRANSFER TIMES
4030
IMAGE CROPPING OF CURRENT ITEM IS PERFORMED BASED ON A PRIORI KNOWLEDGE OF THE DIAGNOSTIC QUESTION
IMAGE FILE SIZE BECOMES DRAMATICALLY REDUCED WHICH IMPROVES INTERNET TRANSFER TIMES
4040
FOR MOVIES, FRAME SPEED IS ADJUSTED BASED ON A PRIORI PHYSIOLOGIC KNOWLEDGE
ELIMINATES NEED FOR USER TO ADJUST MOVIE SPEED AFTER REQUESTING TO VIEW IMAGES
4050
MAGNIFICATION IS ADJUSTED BASED ON A PRIORI KNOWLEDGE OF THE DIAGNOSTIC QUESTION
ELIMINATES NEED FOR USER TO ADJUST MAGNIFICATION AFTER REQUESTING TO VIEW IMAGES
4060
OTHER PARAMETERS ADJUSTED DEPENDING ON DIAGNOSTIC QUESTION
REPEAT FOR EACH "ITEM"

FIG. 6

STEP 4020 – DEFINE SEARCH REGION AS SUBREGION WITHIN IMAGE WHICH CONTAINS THE ORGAN OF INTEREST (EG. HEART) AND SEARCH ALL MOVIE FRAMES FOR THE SINGLE BRIGHTEST PIXEL. SCALE ALL MOVIE FRAMES BY SAME AMOUNT TO MAKE SINGLE BRIGHTEST PIXEL EQUAL TO 2 TO THE 8TH POWER MINUS 1, EG. 255 (1 BYTE/PIXEL, 8–BIT IMAGE).

STEP 4030 – CREATE THUMBNAIL MOVIES BY CROPPING IMAGES SUCH THAT ONLY THE ORGAN OF INTEREST IS SHOWN (EG. HEART).

STEP 4040 – CONVERT ALL MOVIE FRAMES INTO A SINGLE MOVIE WITH FRAME RATE CHOSEN TO SIMULATE REAL TIME MOTION (EG. BEATING HEART)

STEP 4050 – CREATE A FULL–FIELD–OF–VIEW VERSION OF EACH THUMBNAIL SO THAT USER CAN DOUBLE–CLICK TO VIEW ADDITIONAL DETAILS.

FIG. 7A

MEDICAL IMAGE MANAGEMENT SYSTEM
Serial No.: 09/742,575 * Inventors: Judd et al. * Pg. 7 of 19 *
Date of Filing: Dec. 20, 2000 * Atty. Docket No. 3938.01P1

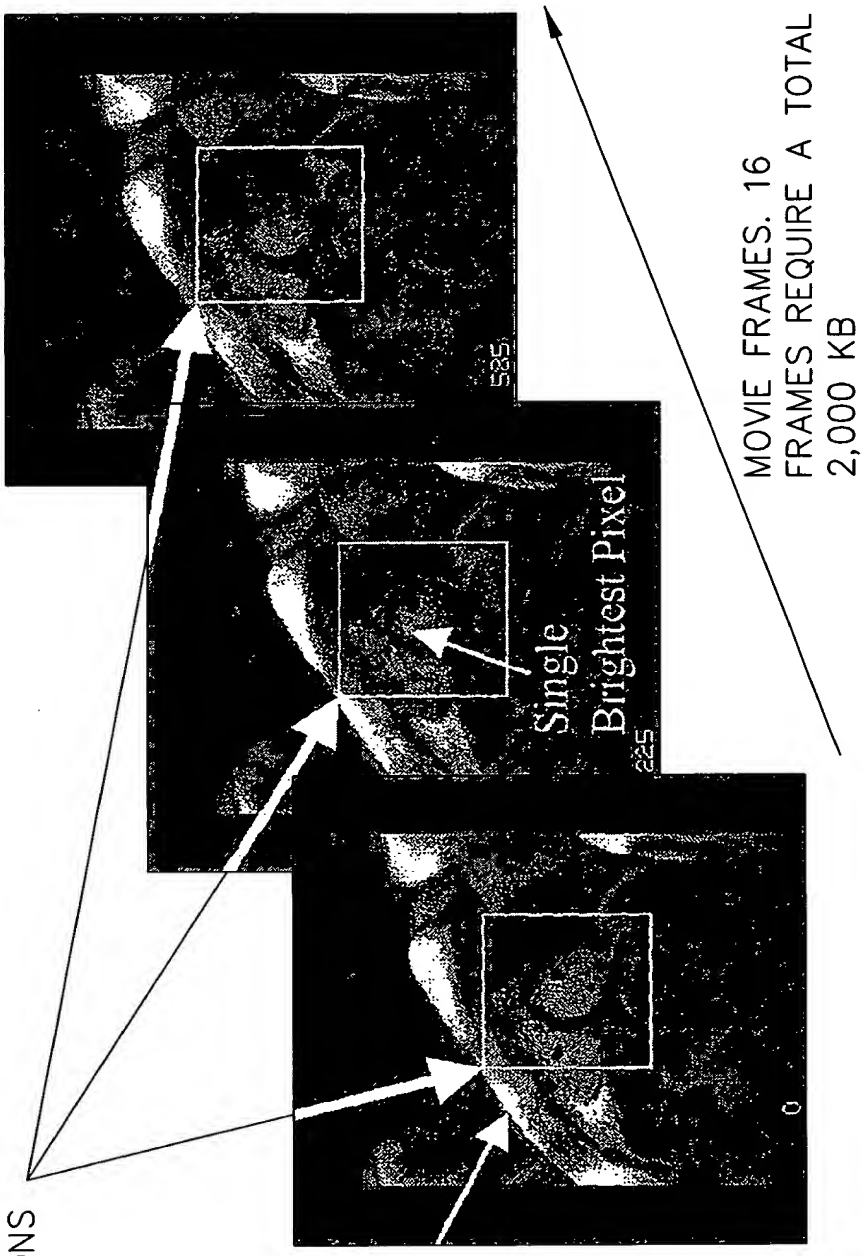
MOVIE FRAMES. 16
FRAMES REQUIRE A TOTAL OF
2,000 KB
535
Single
Brightest Pixel
225
0
SEARCH REGIONS
EXAMPLE OF
BRIGHT PIXEL
OUTSIDE REGION
OF DIAGNOSTIC
INTEREST

FIG. 7B

EG. STEP 4050
FULL FIELD-OF-VIEW MOVIE DISPLAYED FULL SCREEN WHEN THUMBNAIL CLICKED (16 FRAMES=400KB)

EG. STEP 4040
THUMBNAIL MOVIE OF BEATING HEART
(16 FRAMES=100KB)

FIG. 7C

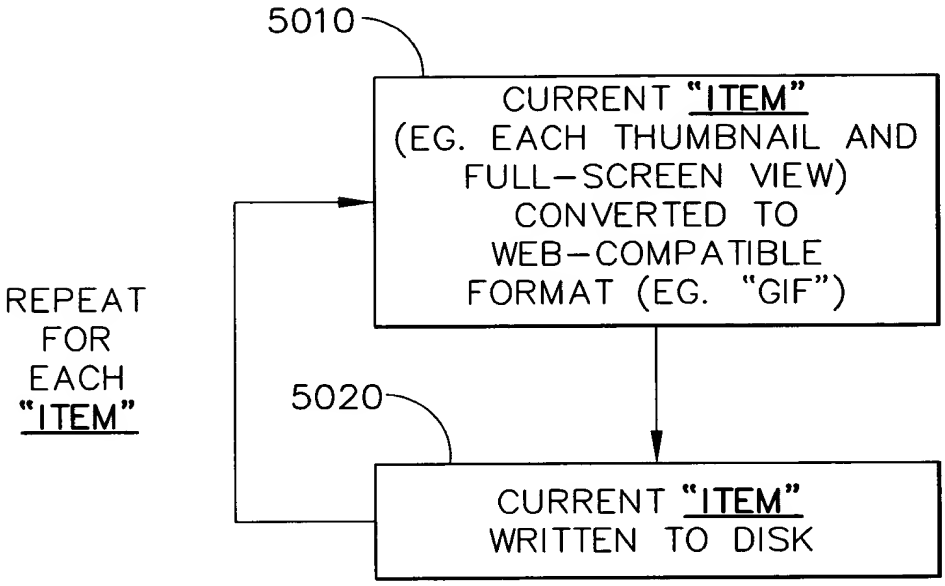
5010
CURRENT "ITEM" (EG. EACH THUMBNAIL AND FULL-SCREEN VIEW) CONVERTED TO WEB-COMPATIBLE FORMAT (EG. "GIF")
5020
CURRENT "ITEM" WRITTEN TO DISK
REPEAT FOR EACH "ITEM"

FIG. 8

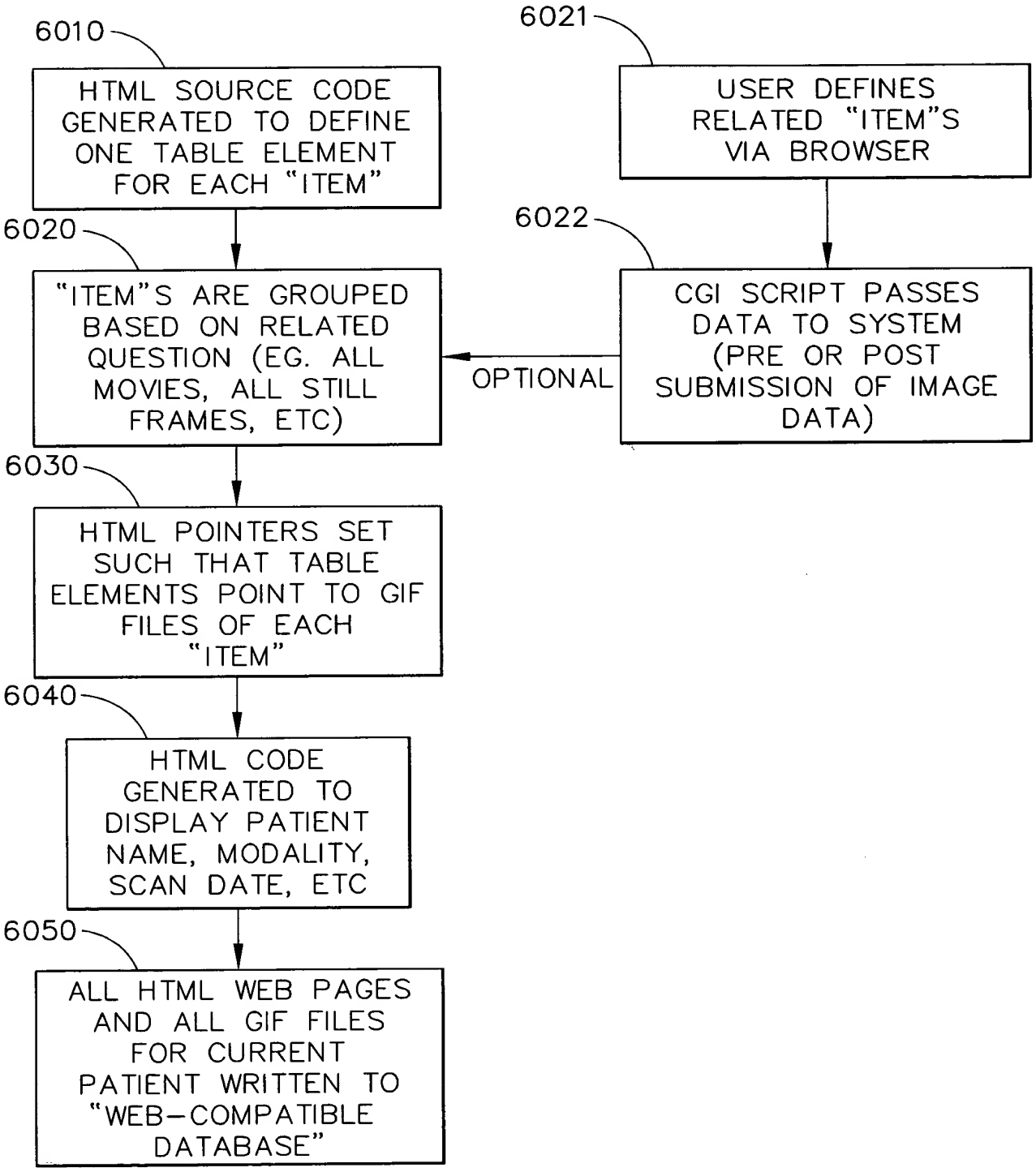
6010
HTML SOURCE CODE GENERATED TO DEFINE ONE TABLE ELEMENT FOR EACH "ITEM"
6021
USER DEFINES RELATED "ITEM"S VIA BROWSER
6020
"ITEM"S ARE GROUPED BASED ON RELATED QUESTION (EG. ALL MOVIES, ALL STILL FRAMES, ETC)
6022
CGI SCRIPT PASSES DATA TO SYSTEM (PRE OR POST SUBMISSION OF IMAGE DATA)
OPTIONAL
6030
HTML POINTERS SET SUCH THAT TABLE ELEMENTS POINT TO GIF FILES OF EACH "ITEM"
6040
HTML CODE GENERATED TO DISPLAY PATIENT NAME, MODALITY, SCAN DATE, ETC
6050
ALL HTML WEB PAGES AND ALL GIF FILES FOR CURRENT PATIENT WRITTEN TO "WEB-COMPATIBLE DATABASE"

FIG. 9

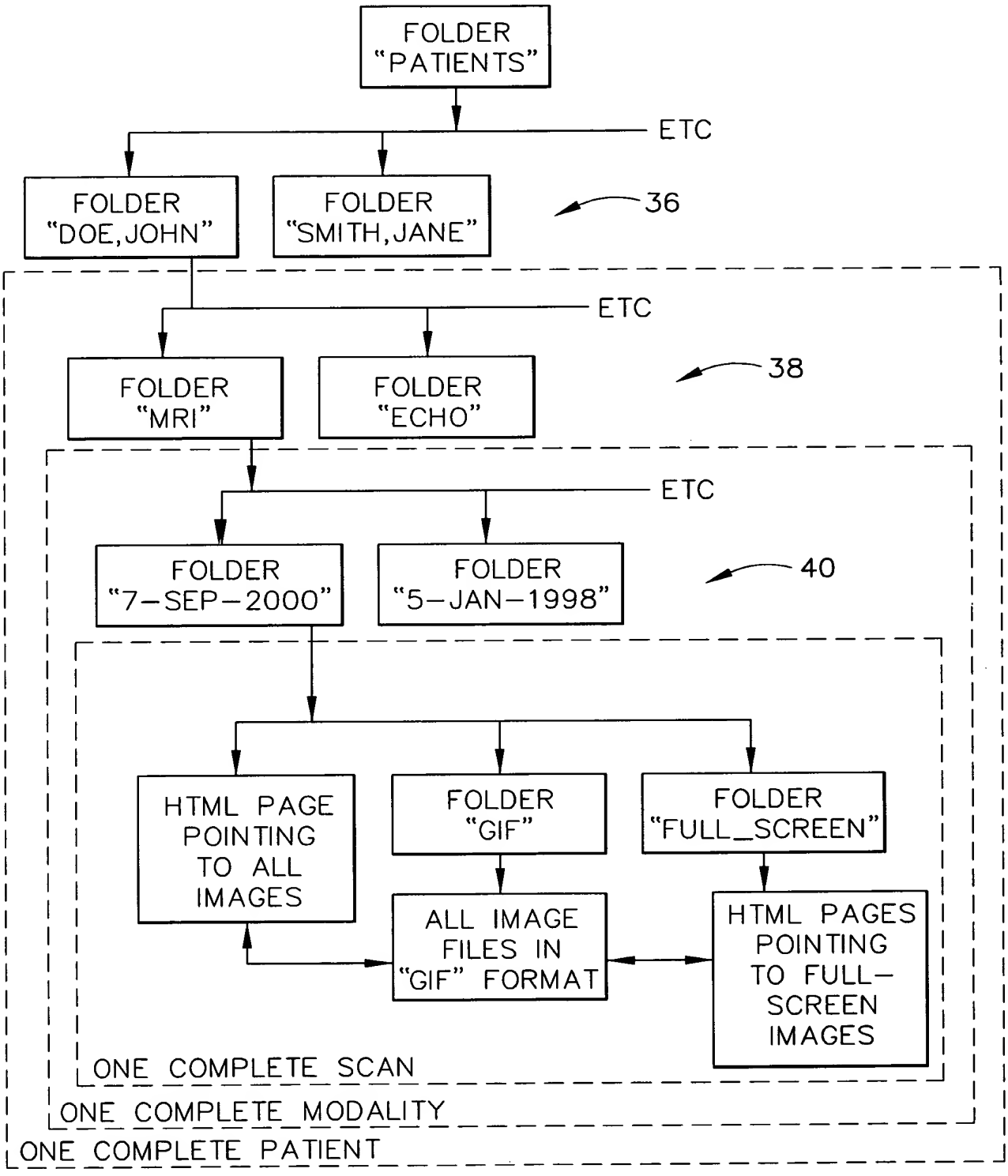
FOLDER "PATIENTS"
ETC
FOLDER "DOE,JOHN"
FOLDER "SMITH,JANE"
36
ETC
FOLDER "MRI"
FOLDER "ECHO"
38
ETC
FOLDER "7-SEP-2000"
FOLDER "5-JAN-1998"
40
HTML PAGE POINTING TO ALL IMAGES
FOLDER "GIF"
FOLDER "FULL_SCREEN"
ALL IMAGE FILES IN "GIF" FORMAT
HTML PAGES POINTING TO FULL-SCREEN IMAGES
ONE COMPLETE SCAN
ONE COMPLETE MODALITY
ONE COMPLETE PATIENT
32

FIG. 10

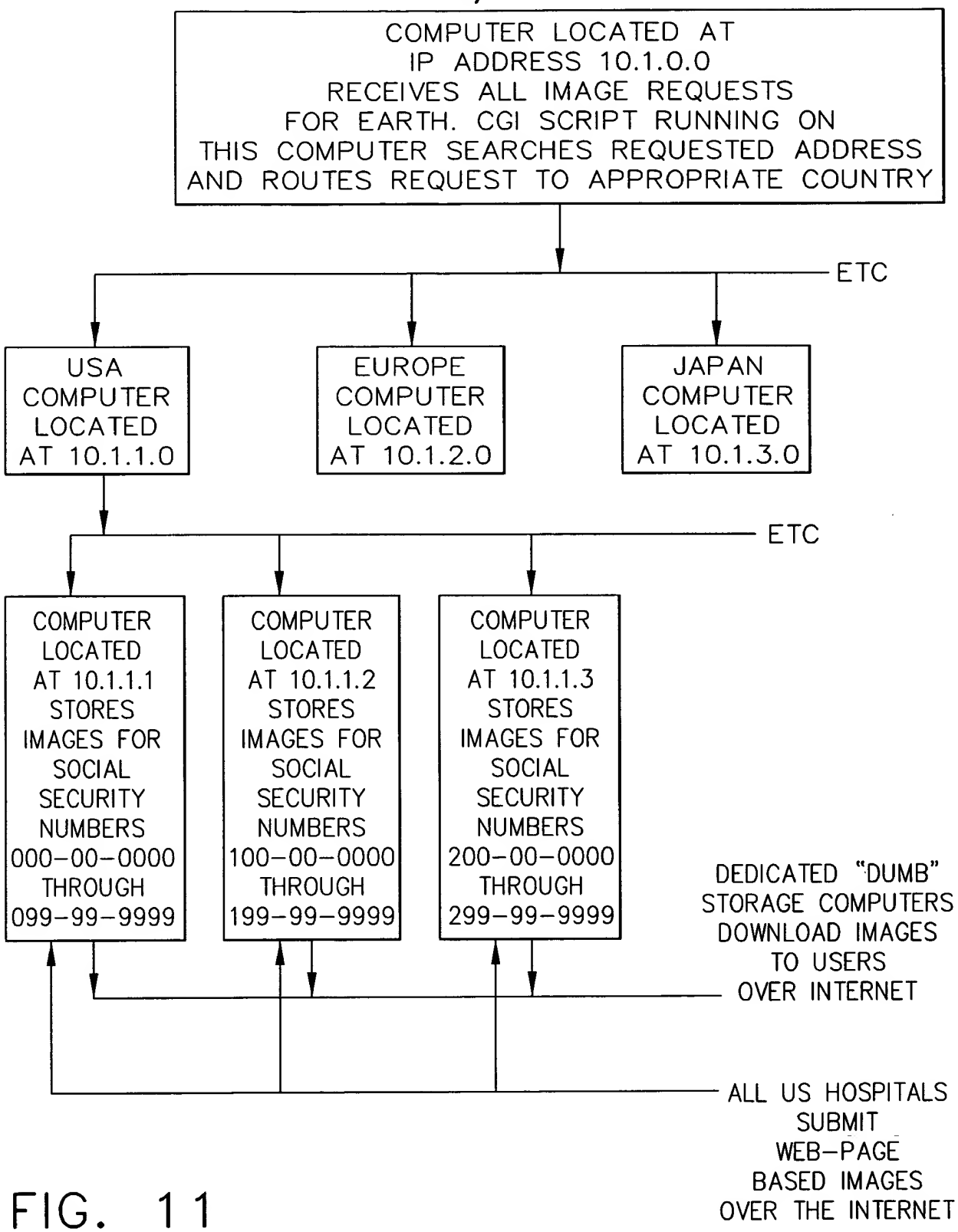
COMPUTER LOCATED AT IP ADDRESS 10.1.0.0 RECEIVES ALL IMAGE REQUESTS FOR EARTH. CGI SCRIPT RUNNING ON THIS COMPUTER SEARCHES REQUESTED ADDRESS AND ROUTES REQUEST TO APPROPRIATE COUNTRY
ETC
USA COMPUTER LOCATED AT 10.1.1.0
EUROPE COMPUTER LOCATED AT 10.1.2.0
JAPAN COMPUTER LOCATED AT 10.1.3.0
ETC
COMPUTER LOCATED AT 10.1.1.1 STORES IMAGES FOR SOCIAL SECURITY NUMBERS 000-00-0000 THROUGH 099-99-9999
COMPUTER LOCATED AT 10.1.1.2 STORES IMAGES FOR SOCIAL SECURITY NUMBERS 100-00-0000 THROUGH 199-99-9999
COMPUTER LOCATED AT 10.1.1.3 STORES IMAGES FOR SOCIAL SECURITY NUMBERS 200-00-0000 THROUGH 299-99-9999
DEDICATED "DUMB" STORAGE COMPUTERS DOWNLOAD IMAGES TO USERS OVER INTERNET
ALL US HOSPITALS SUBMIT WEB-PAGE BASED IMAGES OVER THE INTERNET

FIG. 11

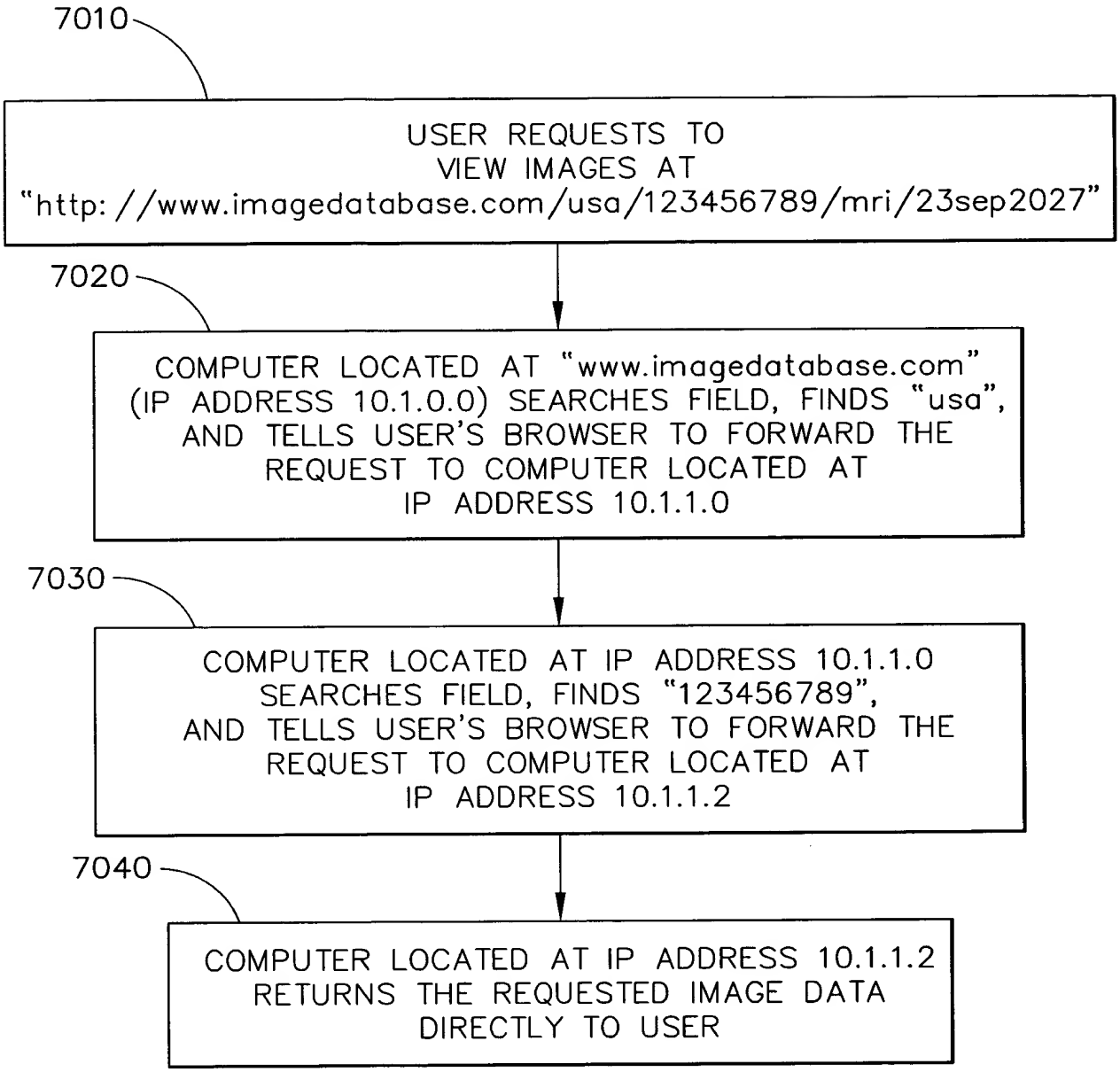
7010
USER REQUESTS TO VIEW IMAGES AT "http://www.imagedatabase.com/usa/123456789/mri/23sep2027"
7020
COMPUTER LOCATED AT "www.imagedatabase.com" (IP ADDRESS 10.1.0.0) SEARCHES FIELD, FINDS "usa", AND TELLS USER'S BROWSER TO FORWARD THE REQUEST TO COMPUTER LOCATED AT IP ADDRESS 10.1.1.0
7030
COMPUTER LOCATED AT IP ADDRESS 10.1.1.0 SEARCHES FIELD, FINDS "123456789", AND TELLS USER'S BROWSER TO FORWARD THE REQUEST TO COMPUTER LOCATED AT IP ADDRESS 10.1.1.2
7040
COMPUTER LOCATED AT IP ADDRESS 10.1.1.2 RETURNS THE REQUESTED IMAGE DATA DIRECTLY TO USER

FIG. 12

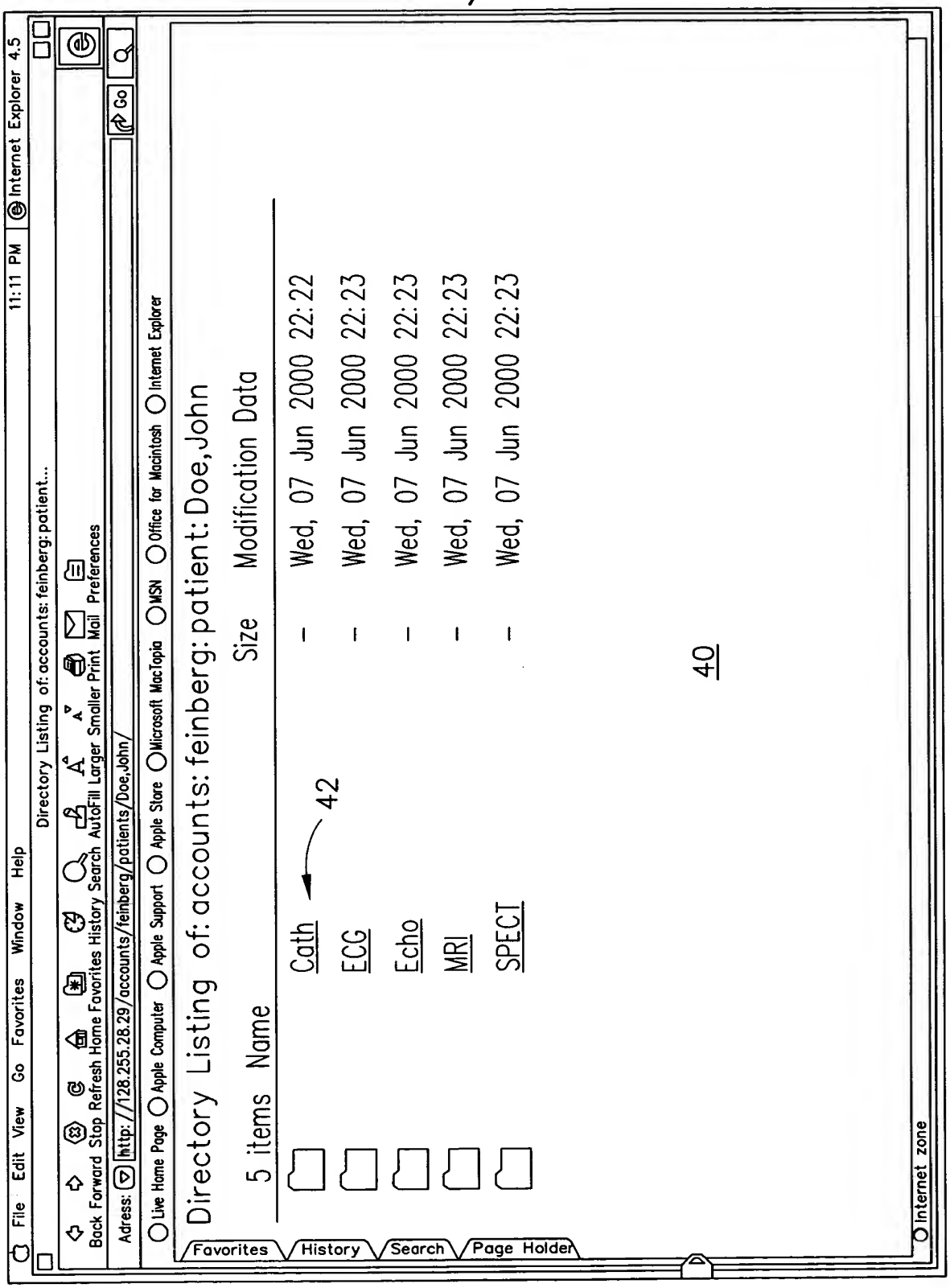
File Edit View Go Favorites Window Help
11:11 PM
Internet Explorer 4.5
Directory Listing of: accounts: feinberg: patient...
Back Forward Stop Refresh Home Favorites History Search AutoFill Larger Smaller Print Mail Preferences
Adress: http://128.255.28.29/accounts/feinberg/patients/Doe,John/
Go
Live Home Page Apple Computer Apple Support Apple Store Microsoft MacTopia MSN Office for Macintosh Internet Explorer
Directory Listing of: accounts: feinberg: patient: Doe,John
5 items
Name
Size
Modification Data
Cath
42
- Wed, 07 Jun 2000 22:22
ECG
- Wed, 07 Jun 2000 22:23
Echo
- Wed, 07 Jun 2000 22:23
MRI
- Wed, 07 Jun 2000 22:23
SPECT
- Wed, 07 Jun 2000 22:23
40
Favorites
History
Search
Page Holder
Internet zone

FIG. 13

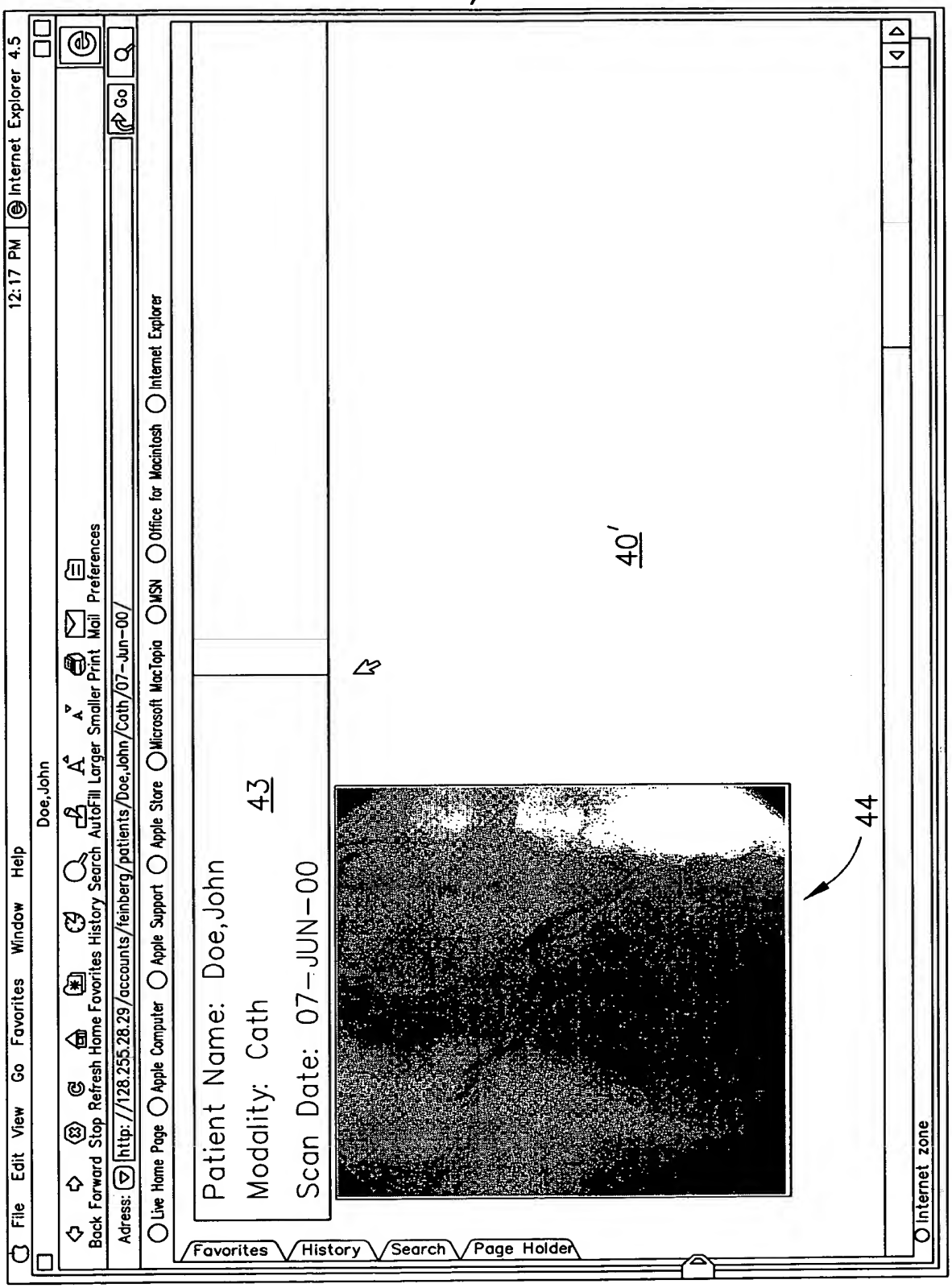
File Edit View Go Favorites Window Help
12:17 PM
Internet Explorer 4.5
Doe,John
Back Forward Stop Refresh Home Favorites History Search AutoFill Larger Smaller Print Mail Preferences
Adress: http://128.255.28.29/accounts/feinberg/patients/Doe,John/Cath/07-Jun-00/
Go
Live Home Page Apple Computer Apple Support Apple Store Microsoft MacTopia MSN Office for Macintosh Internet Explorer
Patient Name: Doe,John
Modality: Cath
Scan Date: 07-JUN-00
43
40'
44
Favorites History Search Page Holder
Internet zone

FIG. 14

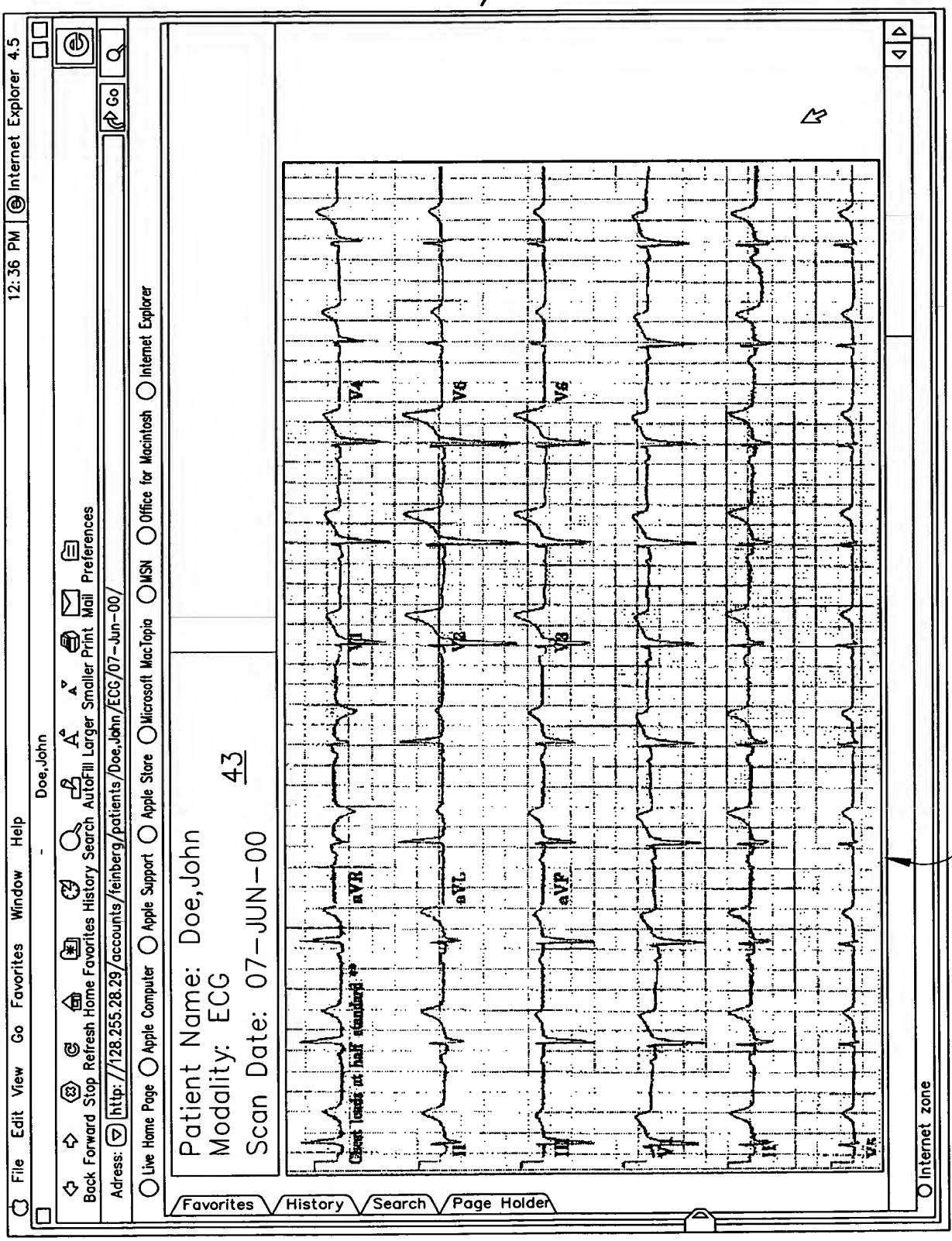
File Edit View Go Favorites Window Help
12:36 PM
Internet Explorer 4.5
Doe,John
Back Forward Stop Refresh Home Favorites History Search AutoFill Larger Smaller Print Mail Preferences
Adress: http://128.255.28.29/accounts/feinberg/patients/Doe,John/ECG/07-Jun-00/
Go
Live Home Page Apple Computer Apple Support Apple Store Microsoft MacTopia MSN Office for Macintosh Internet Explorer
Patient Name: Doe,John
Modality: ECG
Scan Date: 07-JUN-00
43
Favorites History Search Page Holder
Internet zone
44

FIG. 15

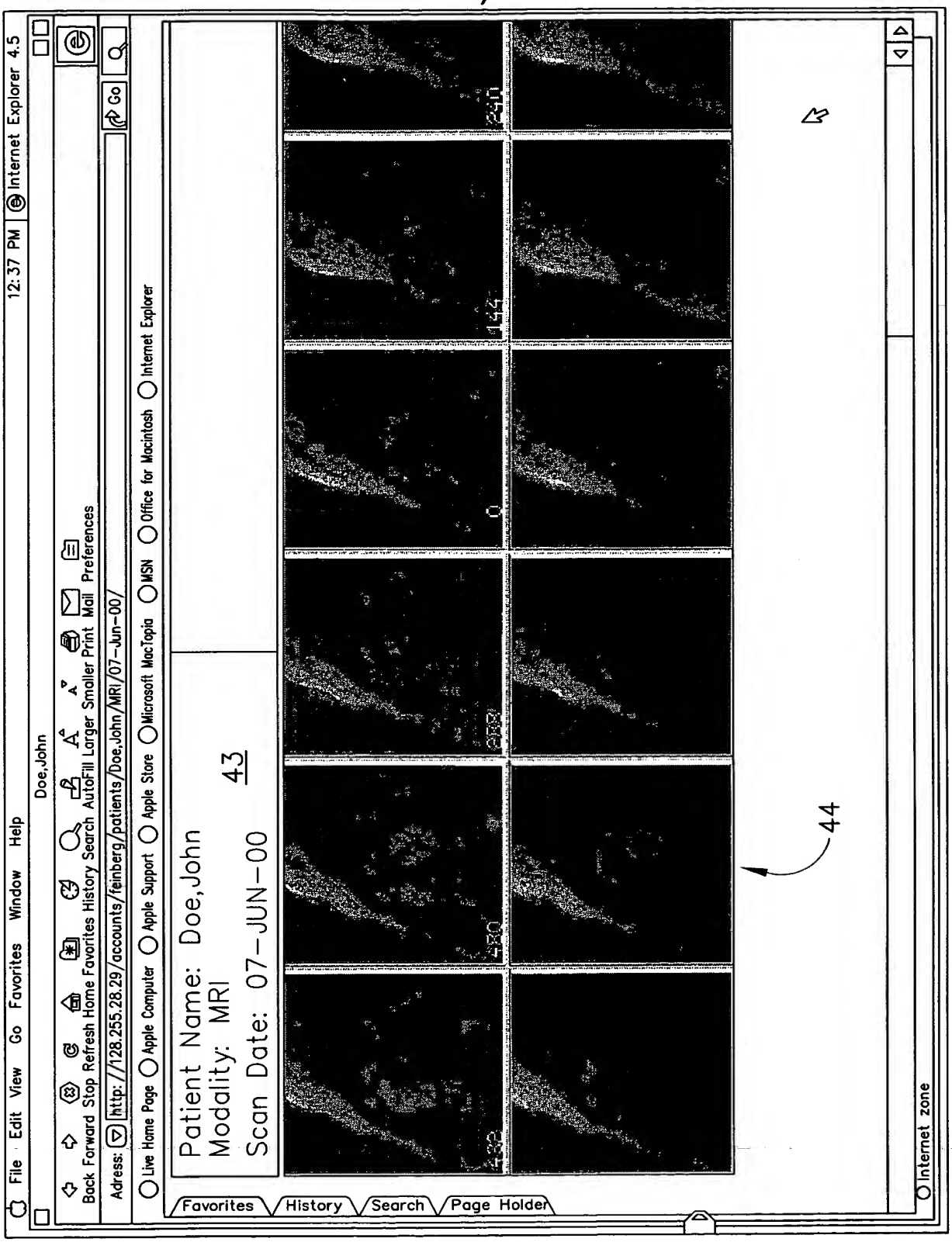
File Edit View Go Favorites Window Help
12:37 PM
Internet Explorer 4.5
Doe,John
Back Forward Stop Refresh Home Favorites History Search AutoFill Larger Smaller Print Mail Preferences
Adress: http://128.255.28.29/accounts/feinberg/patients/Doe,John/MRI/07-Jun-00/
Go
Live Home Page Apple Computer Apple Support Apple Store Microsoft MacTopia MSN Office for Macintosh Internet Explorer
Patient Name: Doe,John
Modality: MRI
Scan Date: 07-JUN-00
43
0
144
288
432
576
720
44
Favorites History Search Page Holder
Internet zone

FIG. 16

19/19

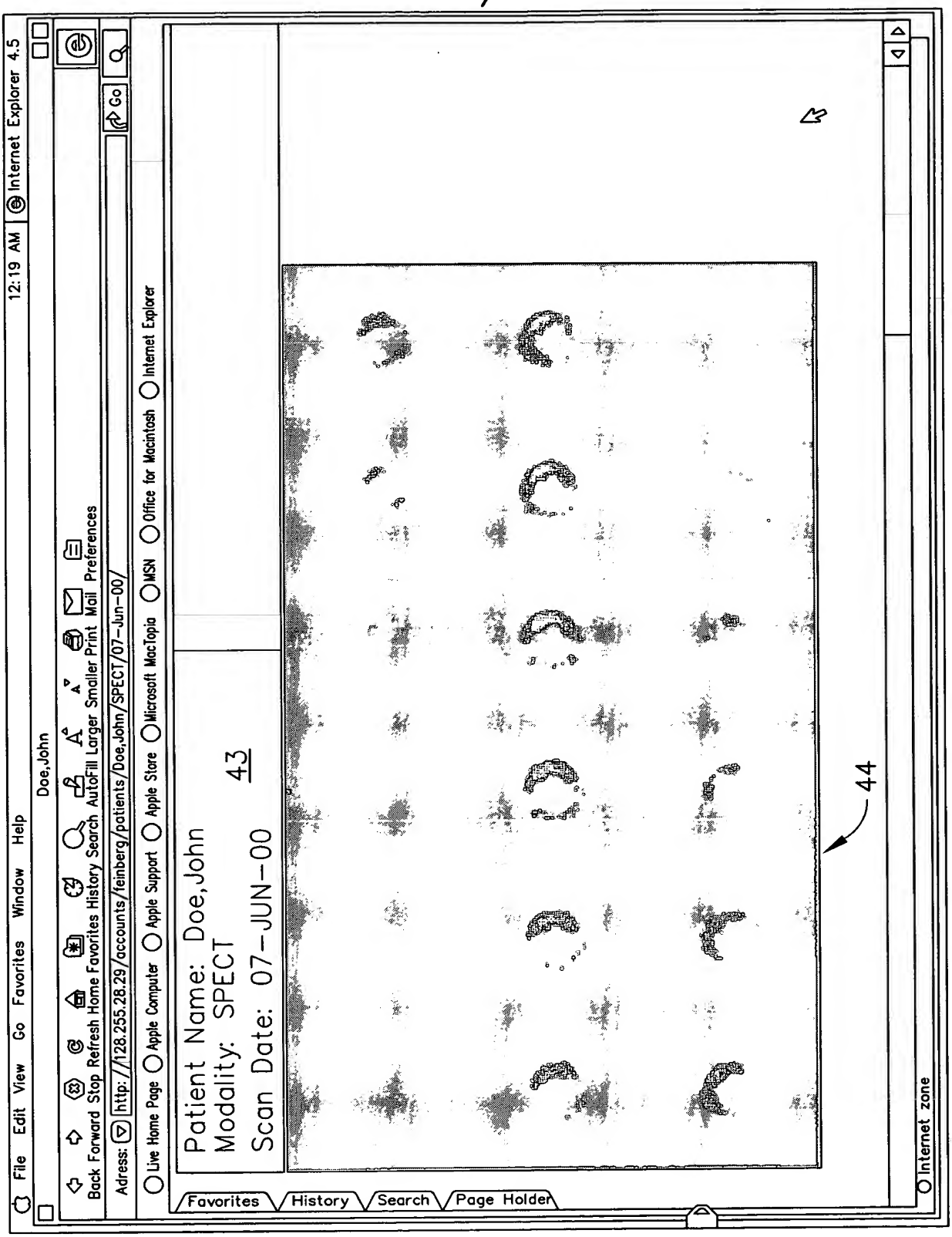
File Edit View Go Favorites Window Help
12:19 AM
Internet Explorer 4.5
Doe,John
Back Forward Stop Refresh Home Favorites History Search AutoFill Larger Smaller Print Mail Preferences
Adress: http://128.255.28.29/accounts/feinberg/patients/Doe,John/SPECT/07-Jun-00/
Go
Live Home Page Apple Computer Apple Support Apple Store Microsoft MacTopia MSN Office for Macintosh Internet Explorer
Patient Name: Doe,John
Modality: SPECT
Scan Date: 07-JUN-00
43
44
Favorites History Search Page Holder
Internet zone

FIG. 17